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Summary Status

Landings and Abundance Trends

## **Atlantic Salmon**

by

John Kocik and Russell Brown

The Atlantic salmon, *Salmo salar*, is a highly prized game and food fish native to New England rivers. The historic North American range of Atlantic salmon extended from the rivers of Ungava Bay, Canada, to Long Island Sound. As a consequence of industrial and agricultural development, most populations native to New England have been extirpated. Remnant native populations of Atlantic salmon in the United States now persist only in eastern Maine. Restoration and rehabilitation efforts, in the form of stocking and fish passage construction, are underway in the Connecticut, Pawcatuck, Merrimack, Penobscot, and eastern Maine rivers of New England.

Atlantic salmon life history is extremely complex owing to its use of both freshwater and marine habitats and long ocean migrations. Atlantic salmon spawn in freshwater during fall. Eggs remain in gravel substrates and hatch during winter, and fry emerge in spring. Juvenile salmon, commonly called parr, remain in freshwater two to three years in New England rivers depending on growth. When parr grow to sufficient size (>16 cm or 6.4 in.) they develop into smolts and migrate to the ocean. Tagging data for New England stocks indicate that US salmon migrate as far north as Greenland.

After their first winter at sea (the fish are now referred to as 1 sea-winter salmon), a small portion of the cohort becomes sexually mature and returns to their natal rivers to spawn. Those remaining at sea feed in the coastal waters of Canada, mostly off Newfoundland and Labrador, and West Greenland. Historically, it has been in these foraging areas that commercial gillnet fisheries for salmon have occurred. After their second winter at sea, most U.S. salmon return home to spawn. Three sea-winter and repeat-spawning salmon life history patterns also occur in New England populations.

The last two decades mark a period of decline in stock status for all Atlantic salmon populations of the North Atlantic. Both indices and complete measures of population abundance indicate that overall survival plummeted as much as fivefold for some stocks during these years. This has intensified concern over the additive effects of natural mortality in the marine environment and habitat issues that persist in U.S. rivers. The US Atlantic Salmon Assessment Committee produces an annual report that includes an index of minimum documented returns to US rivers.

In 1999, only 1,452 adults returned to US rivers, one of the lowest returns in a time-series that dates from 1970. At present, these data provide the best index to US stock abundance. This value is dominated by returns to the Penobscot River, which typically comprise more than 60% of total returns on an annual basis.

Homewater fisheries are limited to recreational angling on surplus broodstock in the upper Merrimack River. Angler catches in Maine have averaged approximately 486 salmon in recent years. Declines in runs have led to a no retention policy statewide, thus actual landings have been zero. Targeted Atlantic salmon fishing in Maine was suspended in 2000 and will not be reopened until populations reach conservation targets. The Merrimack River broodstock fishery began in 1993 and has resulted in an annual catch of approximately 1,000 salmon. The popularity of the fishery is reflected in increased license sales in successive years. Management authority for Atlantic salmon in U.S. waters resides with the states and the New England Fishery Management Council.

The commercial fisheries in Canada and Greenland are managed under the auspices of the North Atlantic Salmon Conservation Organization (NASCO), of which the United States is a member. These fisheries have been evaluated by extensive tagging experiments with U.S. stocks. Harvest estimates based on Carlin tag returns from 1975 to 1988 indicated exploitation rates of approximately 60% and 80%, for the U.S. 1-seawinter and 2-seawinter stock components, respectively. These results indicate that the stocks were overexploited.

The Greenland fishery is managed by a quota system that has been in place since 1972. In 1993, a multi-year quota system was agreed to within NASCO that provided a framework for quota setting based on a forecast model of salmon abundance. The 1993 and 1994 quotas were bought out through a private initiative, but the fishery resumed in 1995 and 1996. In 1997, the NASCO agreement was modified to allow for a local use fishery and to provide for data collection when stock abundance is below recommended conservation levels. The mixed stock fisheries in Canada have been managed by time-area closures and quotas. The fisheries around Newfoundland and in southern Labrador have been closed under moratorium by the Canadian government since 1992 and 1997, respectively. The only remaining commercial fishery in Canada is a small Native Peoples' fishery in Ungava Bay.

In response to a petition request to list Atlantic salmon as endangered under the Endangered Species Act, the National Marine Fisheries Service and U.S. Fish and Wildlife Service conducted a status review of salmon populations in New England and developed a proposed rule to list several stocks in eastern Maine as threatened under the Act. Subsequently, the State of Maine developed a conservation plan to meet the goals of the proposed rule. The services withdrew the proposed rule and worked with the state to implement the conservation plan in lieu of a listing action. Despite these efforts, populations remain critically low, and with documentation of new disease threats the Gulf of Maine Distinct Population Segment has since been listed as endangered.

Despite declining natural populations, the Atlantic salmon mariculture industry continues to develop worldwide. Private aquaculture companies have explored several rearing options for

Atlantic salmon ranging from land-based freshwater rearing facilities, to sea ranching and sea cage rearing. In eastern Maine and Maritime Canada, companies typically rear fish to smolt stage in private freshwater facilities, transfer them into anchored net pens or sea cages, feed them to accelerate growth, and harvest the fish once they reach market size. In the Northwest Atlantic, 62% of production is based in Canada with 99.4 % of Canadian production in the Maritimes and 0.6% in Newfoundland. The balance of Northwest Atlantic production is in eastern Maine. The production trends for these facilities and areas occupied by marine cages have grown exponentially for two decades. By 1998, there were at least 35 freshwater smolt-rearing facilities and 124 marine production facilities in eastern North America. Since the first experimental harvest of Atlantic salmon in 1979 of 6 mt, the mariculture industry in eastern North America has grown to produce greater than 32,000 mt annually since 1997. In Maine, production has exceeded 10,000 mt since 1995. These captive stocks have reduced harvest pressure on wild stocks but pose potential genetic, disease, and competitive threats. While mariculture presents new management challenges, it offers opportunities for innovative rehabilitation and restoration strategies- an approach that is being tested in Maine. Current management efforts focus on the recovery of natural populations and support of sustainable aquaculture to manage both these population segments as sustainable resources.

### **For further information**

Colligan, M. A.; Kocik, J. F.; Kimball, D. C.; Marancik, G.; McKeon, J. F.; Nickerson, P. R. Status Review for Anadromous Atlantic Salmon in the United States. National Marine Fisheries Service/ U.S. Fish and Wildlife Service Joint Publication. Gloucester, MA 232 pp.

U.S. Atlantic Salmon Assessment Committee. 2000. Annual Report of the U.S. Atlantic Salmon Assessment Committee Report Number 12 - 1999 Activities. Gloucester, Massachusetts.  
(<http://www.fws.gov/r5crc/stuff/ascom00.html>)

## Summary Status

Long-term potential catch (MSY)	=	Unknown
Biomass corresponding to MSY ( $B_{MSY}$ )	=	Unknown
Minimum biomass threshold	=	N/A
Stock biomass in 1999	=	Unknown
$F_{MSY}$	=	Unknown
$F_{TARGET}$	=	N/A
$F_{1999}$	=	Unknown
Overfishing definition	=	Not defined
Age at 50% maturity	=	2 sea-years
Size at 50% maturity	=	71.0 cm (28.0 in.)
Assessment level	=	Age structured
Status of exploitation	=	Protected
Management	=	Atlantic Salmon FMP NASCO Treaty optimum yield is set at zero under FMP

**M = 0.12**

**$F_{0.1}$  = Unknown**

**$F_{max}$  = Unknown**

### *Atlantic Salmon Returns and Mariculture Production*

